

## REMARKS

The present Amendment is in response to the Office Action mailed January 14, 2008. Claims 1 and 10 are amended and new claims 29-30 are presented. Claims 1-4, 6, 8, 10-13, 15, 17, and 23-30 remain pending. Applicant notes that the following remarks are not intended to be an exhaustive enumeration of the distinctions between any cited references and the claimed invention. Rather, the distinctions identified and discussed below are presented solely by way of example to illustrate some of the differences between the claimed invention and the cited references. Applicant also notes that the remarks presented herein have been made merely to clarify the claimed embodiments from elements purported by the Examiner to be taught by the cited reference. Such remarks, or a lack of remarks, are not intended to constitute, and should not be construed as, an acquiescence, on the part of the Applicant: as to the purported teachings or prior art status of the cited references; as to the characterization of the cited references advanced by the Examiner; or as to any other assertions, allegations or characterizations made by the Examiner at any time in this case. Applicant reserves the right to challenge the purported teaching and prior art status of the cited references at any appropriate time. Reconsideration of the application is respectfully requested in view of the above amendments to the claims and the following remarks.

## Examiner Interview

Applicant thanks the Examiner for the courtesies extended during the telephonic interview conducted on July 7, 2008. This response includes the substance of the interview.

## Rejections under 35 U.S.C. 102

The Office Action rejected claim 1-4, 6, 8, 10-13, 15, 17, and 23-28 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,949,672 (*Bernet*). Because *Bernet* fails to teach or suggest each and every element of the pending claims,

Applicant traverses the rejection and respectfully submits that the claims are patentable over the cited art.

Claim 1 is directed to a matrix converter and has been amended to recite a controller that is connected with the commutation circuitry. The controller controls timing operations in the bi-directional switches in said matrix switch arrangement to effect commutation functions by the initiation of one switch before de-activation of another switch to compensate for a turn-off time of the one switch and provide a commutation interval which approaches or equals zero.

As discussed during the interview, claim 1 has been amended to recite that the initiation of one switch and the de-activation of another switch are controlled by a controller. In claim 1, the timing operations are performed by a controller to compensate for a turn-off time of the one switch and provide a commutation interval which approaches or equals zero.

The ability to control the commutation interval and/or compensate for a turn-off time of the one switch is not taught or suggested by *Bernet*. As discussed during the interview, interval V (illustrated in Figure 5 of *Bernet*) shows that there is a time  $t_3$  where the process of switching  $S_{22}$  off occurs. The process of switching  $S_{21}$  on takes place at time  $t_4$ . *Bernet* teaches a delay between  $t_3$  and  $t_4$ . *Bernet* teaches that this delay is caused "by the active process of switching  $S_{22}$  off at  $t_3$ , with the current  $i_{sg2}$  commutating into the three capacitances in the second switch group and reversing their charge during an oscillation process." See col. 9, ll. 39-46.

The commutation taught by *Bernet* relies on a resonance circuit and achieves commutation using a "resonance capacitance . . . connected in parallel with each main switch . . ." See abstract. For example, the capacitive resonance taught by *Bernet* is illustrated by the teaching that "[r]esonance capacitors  $C_{r11}$ ,  $C_{r12}$ , and  $C_{r13}$  are connected in parallel with the main switches." See col. 4, ll. 15-16. *Bernet* further illustrates the need for resonance circuitry by teaching capacitive commutation (forced commutation with an active switching-off process). See col. 5, ll. 55-56. Figure 4 further illustrates that the commutations include capacitive and ARCP (inductive) commutations. This illustrates that *Bernet* requires resonant circuits, including capacitors, to achieve commutation.

As discussed during the interview, the use of resonant circuits, including capacitors, to achieve commutation, is related to the delay that occurs during commutation, including the delay illustrated by interval V in Figure 5. In other words, the delay appears to be related to the use of resonant circuits.

In contrast to the resonance circuits taught by *Bernet* (and associated inductors, capacitors, switches, and diodes), embodiments of the present invention are directed to an entirely different commutation technique. For example, claim 1 recites a matrix switch arrangement including a plurality of power semiconductor bi-directional switches arranged in a matrix configuration. In claim 1, the controller controls timing operations . . . to effect commutation functions and does not relay, as taught by *Bernet*, on resonant circuits. For instance, claim 1 initiates one switch before de-activation of another switch to compensate for a turn-off time of the one switch and the matrix switch arrangement provides a commutation interval which approaches or equals zero.

As discussed during the interview, performing timing operations to compensate for a turn-off time of the one switch and provide a commutation interval which approaches or equals zero is not taught or suggested by the resonant circuits that have a delay as discussed above. The ability of *Bernet* to affect the commutation interval is dependent on the capacitors and other resonant circuits. The associated delay therefore teaches away from a commutation interval that approaches or equals zero, as recited in claim 1.

Claim 1 has been amended to further recite that the controller controls timing operations to compensate for a turn-off time of the one switch and provide a commutation interval which approaches or equals zero. *Bernet*, in contrast, introduces the delay illustrated in Figure 5 during the "process of switching S<sub>21</sub> on and switching S<sub>31</sub> off." See col. 9, lls. 41-42. As a result, *Bernet* fails to teach or suggest the controller and the timing operations recited in claim 1.

Claim 10 has been amended to recite that delay times for a plurality of timers are identified and that the plurality of timers determine the activation of the first switch and the de-activation of the second switch. Controlling the activation and de-activation thus provides a commutation interval that approaches or equals zero.

In contrast, the switches taught by *Bernet* have a delay related to the resonant circuits as discussed above. Further, there is no teaching or suggestion of a plurality of timers that determine the activation of the first switch and the de-activation of the second switch, as discussed during the interview.

Claim 29 has at least some generally similar elements to claims 1 and 10. For example, claim 29 recites a controller that sets a commutation time using a plurality of timers to effect an overlap between turning off the first bi-directional switch and turning on a second bi-directional switch in order to generate the determined commutation time. The resonant circuits taught by *Bernet* introduce delay and fail to teach or suggest a plurality of timers to effect an overlap between turning off the first switch and turning on the second switch as recited in claim 29.

For at least the reasons discussed herein and as discussed during the interview, Applicant respectfully submits that claims 1, 10, and 29 and the pending dependent claims are allowable over the cited art.

### Conclusion

In view of the foregoing, Applicants believe the claims as amended are in allowable form. In the event that the Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview, or which may be overcome by an Examiner's Amendment, the Examiner is requested to contact the undersigned attorney.

Dated this 14<sup>th</sup> day of July, 2008.

Respectfully submitted,

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